Why Economists Use Models

The University of Notre Dame
Professor Sims
Fall 2010

Broadly defined, economics is the study of how people, firms and economies as a whole allocate their scarce resources so as to satisfy their unlimited desires. Economists are interested in making statements about how changes in policies and incentives affect behavior. Concretely, we are interested in inferring something about causation. If the price of apples were to change, what would happen to the quantity of apples consumed? If the government were to change income tax rates, what would happen to labor supply? If the Fed were to cut interest rates, how would household spending change? What would happen to the intensity of job search if the government were to increase unemployment benefits?

These questions seem relatively simple, but are difficult to answer in practice. As a social science – as opposed to an experimental science – it is very difficult to infer causation from observed economic data. Economists typically can’t run experiments the way that “hard” scientists can, so we are left to build models to help us understand how the world works.

To make this point concrete, consider an example from the pharmaceutical industry. Suppose that you invented a new drug that you hope will lower cholesterol. How would you proceed to see how it works? Well, you would probably begin by running tests in a laboratory. You might start with lab rats. You would subject two different sets of rats to exactly the same conditions, except you give one group the drug. Then you measure outcomes of interest in the two groups. Provided you set up your experiment well, after a period of time you can see how the outcomes of the group given the drug differ from the group not given the drug. You can then infer that this difference is the causal impact of the drug.

Unfortunately, in economics natural experiments are rare. This is particularly true for the economy as a whole. One particular question macroeconomists are interested in answering is: what is the effect on economic activity of the Fed lowering interest rates? Answering this question is not as simple as just looking at the correlation among interest rates and GDP in the data. This is because changes in interest rates both affect and are affected by economic activity. Thus, the correlation among interest rates and GDP in the data confounds the effects of GDP on interest rates with the effects of interest rates on GDP. In order to identify the causal effect of interest rates on output, we either need to (a) identify time periods where the interest rate changed for reasons unrelated to the real economy and then see what happened to output or (b) have a model that allows us to run our own natural experiment. The option in (a) is not a very good one, simply because it’s very difficult (and controversial) to identify such periods – put simply, the Fed just doesn’t go around running natural experiments for us. Thus, economists have resorted to option (b), and this will form the basis of much of our course.

So what is a model? A model is simplified and abstract description of reality. It frequently (but need not necessarily) takes the form of a set of mathematical relationships that represent the behavior of economic actors. Generically, a model takes some information
as “inputs” and produces “outputs”. In economics we usually refer to the “inputs” as exogenous variables and the “outputs” as endogenous variables.

With a model in hand, we can run experiments. We can change the interest rate and see what happens. We can lower tax rates and see if labor supply increases. We can provide an answer to the question of whether fiscal stimulus “works”. The model is useful precisely because we can make definitive statements about causality.

The drawback of working with models is that they rely upon assumptions which are undoubtedly violated in the real world. To the extent to which these assumptions are wrong, the conclusions we draw from our models will be invalid. Thus, it is an important task of economists to constantly refine our models by “taking them to the data”. Models make predictions about how the world should work and look. Hence, by comparing actual data to the predictions of our models, we can identify areas in which the models work well and others in which they don’t. By then focusing on those areas where the model underperforms we can improve our ability to explain the real world and to provide relevant policy advice.

The models we start with are embarrassingly simple descriptions of an extremely complicated thing (a modern developed economy). In spite of their simplicity, these models are still useful in that they can provide strong insights and intuition into how the world works. As we progress through the course we will refine our models by making them more and more realistic.